FIGURE 1a

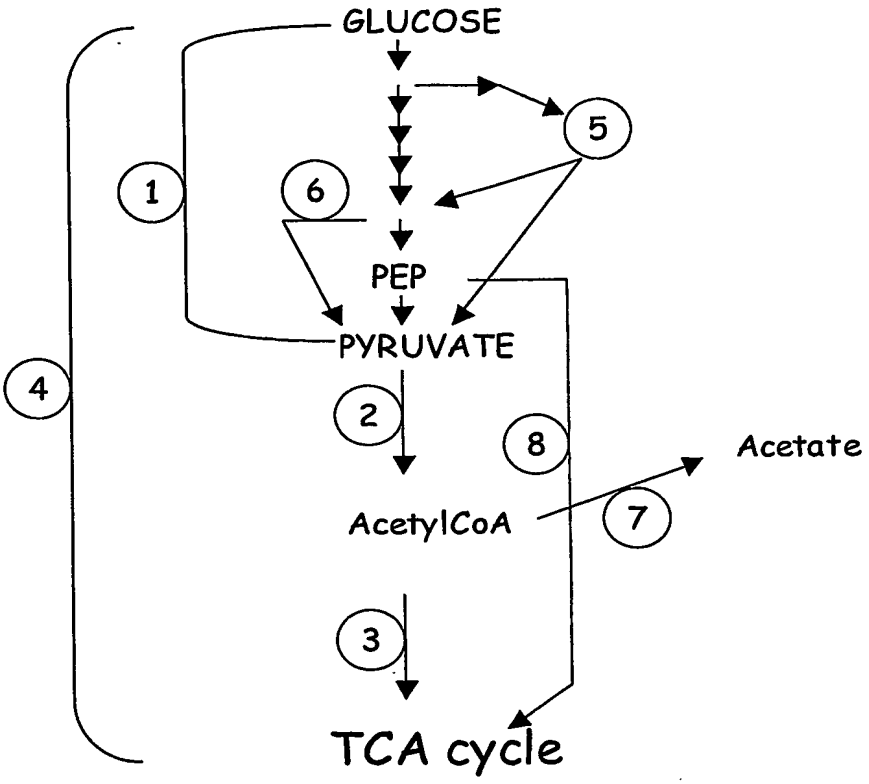
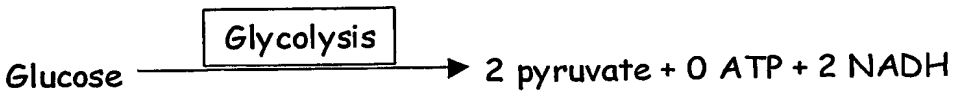


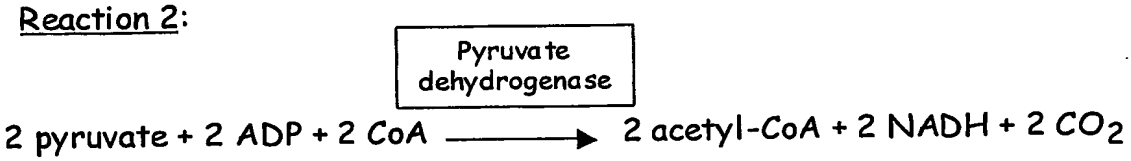
Figure 1a.
Schematic representation of some interconnected metabolic routes involved in glucose assimilation. The numbers represents the reactions described more in detail in Table 1. Reactions 1-3 comprise the most efficient pathway for glucose assimilation. Reaction 4 is the sum of reactions 1-3. All the other reactions (5-8) are alternative routes that in general, are less efficient or skip the formation of some important metabolic intermediates.

FIGURE 1b

Reaction 1:

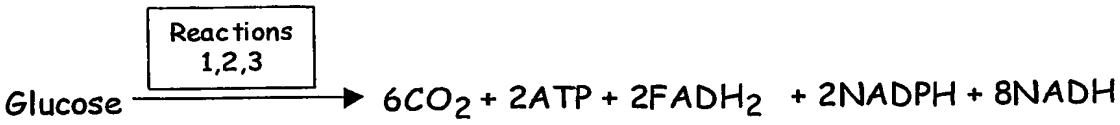


Reaction 2:



Reaction 3:

Reaction 4:



Reaction 5:

Figure 2.

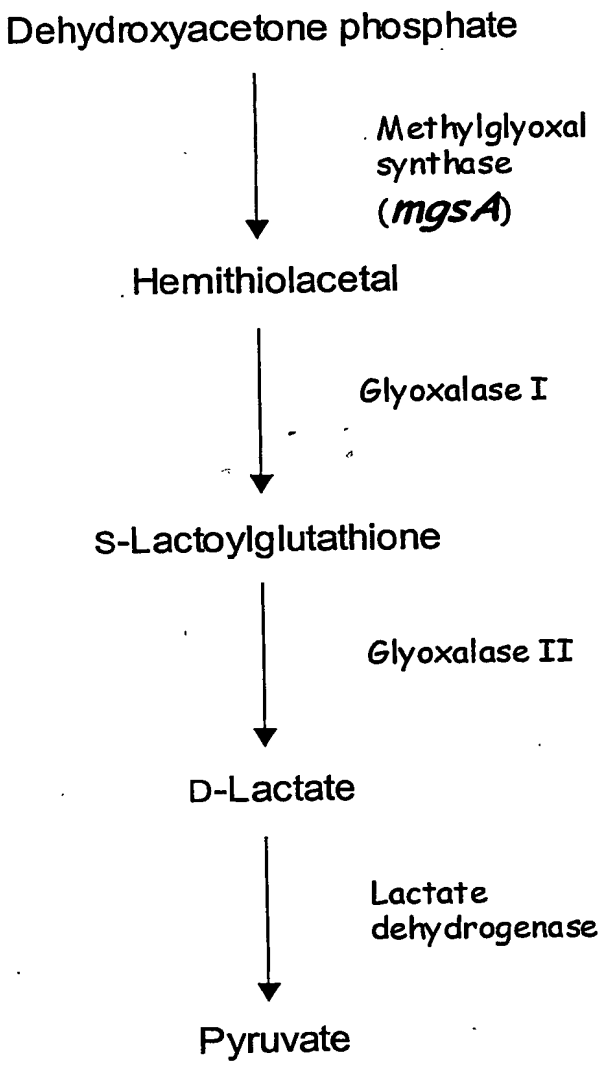

Dehydroxyacetone phosphate
Methylglyoxal synthase (mgsA)
Hemithiolacetal
Glyoxalase I
S-Lactoylglutathione
Glyoxalase II
D-Lactate
Lactate dehydrogenase
Pyruvate

FIGURE 3A

(a) SEQ ID NO. 1
ArcA1
CACATTCTTATCGTTGAAGACGAGTTGGTAACACGCAACACGTGTAGGCTGGAGC
TGCTTC

(b) SEQ ID NO. 2
ArcA2
TTCCAGATCACCGCAGAAGCGATAACCTTCACCGTGAATGGTCATATGAATATCCT
CCTTAG

(c) SEQ ID NO. 3
ArcA3
AGTTGGTAACACGCAACACGCAAC

(d) SEQ ID NO. 4
ArcA4
CGCAGAAGCGATAACCTTCACCG

(e) SEQ ID NO. 5
Edd1
ATGAATCCACAATTGTTACGCGTAACAAATCGAATCATTGAACGTTCGCGCGAGA
CTCGCTCTGCTTATCTCGCCCGGATTTATCGATAAGCTGGATCC

(f) SEQ ID NO. 6
Edd2
TTAAAAAGTGATACAGGTTGCGCCCTGTTCGGCACCGGACAGTTTTTCACGCAAG
GCGCTGAATAATTCACGTCCTGTCGGATGCATATGGCGGCCGC

(g) SEQ ID NO. 7
Edd3
TAACATGATCTTGCGCAGATTG

(h) SEQ ID NO. 8
Edd4
ACTGCACACTCGGTACGCAGA

(i) SEQ ID NO. 9
DackA-F
ATGTCGAGTAAGTTAGTACTGGTTCTGAACTGCGGTAGTTCTTCACTGAAATTTGC
CATCATCGATGCAGTAAATGGTGATGTGTAGGCTGGAGCTGCTT

FIGURE 3B

(j) SEQ ID NO. 10
Dpta-R
TTACTGCTGCTGTGCAGACTGAATCGCAGTCAGCGCGATGGTGTAGACGATATCG
TCAACCAGTGCGCCACGGGACAGGTCATATGAATATCCTCCTTAG

(k) SEQ ID NO. 11
Ack-U
ATTCATTGAGTCGTCAAATT

(l) SEQ ID NO. 12
Ack-D
ATTGCGGACATAGCGCAAAT

(m) SEG ID NO. 13
MgsA-1
GTACATTATGGAACTGACGACTCGCACTTTACCTGCGCGGTGTAGGCTGGAGCTG
CTTCG

(n) SEQ ID NO. 14
MgsA-2
CTTCAGACGGTCCGCGAGATAACGCTGATAATCGGGGATCCATATGAATATCCTC
CTTAG

(o) SEQ ID NO. 15
MgsA-3
CTTGAATTGTTGGATGGCGATG

(p) SEG ID NO. 16
MgsA-4
CGTCACGTTATTGGATGAGAG

(q) SEQ ID NO. 17
PpcR
TCGCATTGGCGCGAATATGCTCGGGCTTTGCTTTTCGTCAGTGGTTGAATTATTTG
CTCAGGATGTGGCATTGTCAAGGGCATATGAATATCCTCCTTAG

(r) SEQ ID NO. 18
PpcF
CGATTTTTTAACATTTCCATAAGTTACGCTTATTTAAAGCGTCGTGAATTTAATGA
CGTAAATTCCTGCTATTTATTCGTGTGTAGGCTGGAGCTGCTTC

FIGURE 3C

(s) SEQ ID NO. 19
1.6GI promoter
CGAGCCGTCACGCCCTTGACAATGCCACATCCTGAGCAAATAAT

(t) SEQ ID NO. 20
Short 1.6 GI promoter
GCCCTTGACAATGCCACATCCTGAGCAAATAATTCAACCACT

(u) SEQ ID NO. 22
Short 1.5 GI promoter
GCCCTTGACTATGCCACATCCTGAGCAAATAATTCAACCACT

(v) SEQ ID NO. 23
GapA-R1
AGTCATATATTCCACCAGCTATTTGTTAGTGAATAAAAGTGGTTGAATTATTTGCT
CAGGATGTGGCATAGTCAAGGGCATATGAATATCCTCCTTAG

(w) SEQ ID NO. 24
GapA-R2
GCTCACATTACGTGACTGATTCTAACAAAACATTAACACCAACTGGCAAAATTTTG
TCCGTGTAGGCTGGAGCTGCTTCG

(x) SEQ ID NO. 25
GapA-R3
GTCGACAAACGCTGGTATACCTCA

(y) SEQ ID NO. 26
GapA-R5
AGTCATATATTCCACCAGCTATTTGTTAGTGAATAAAAGTGGTTGAATTATTTGCT
CAGGATGTGGCATTGTCAAGGGCATATGAATATCCTCCTTAG

Figure 4a

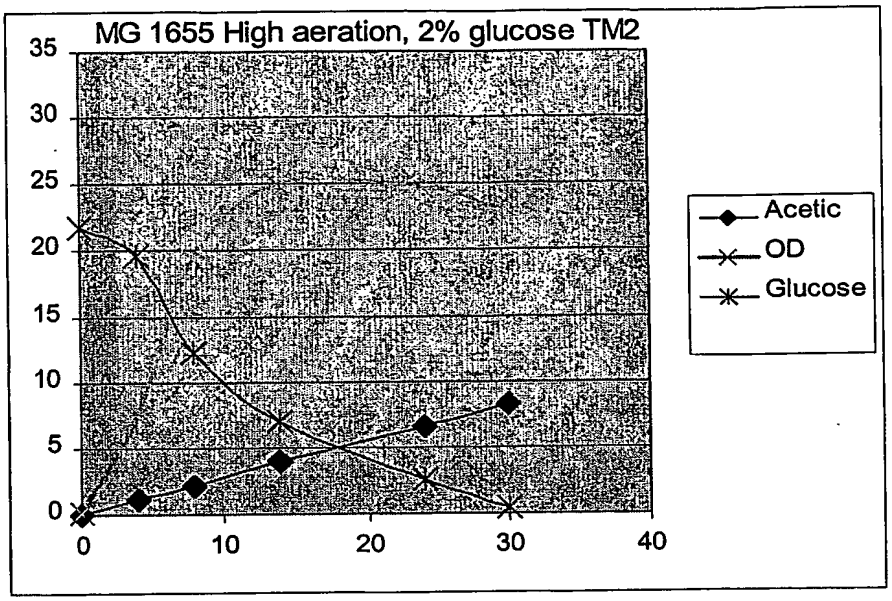


Figure 4b.

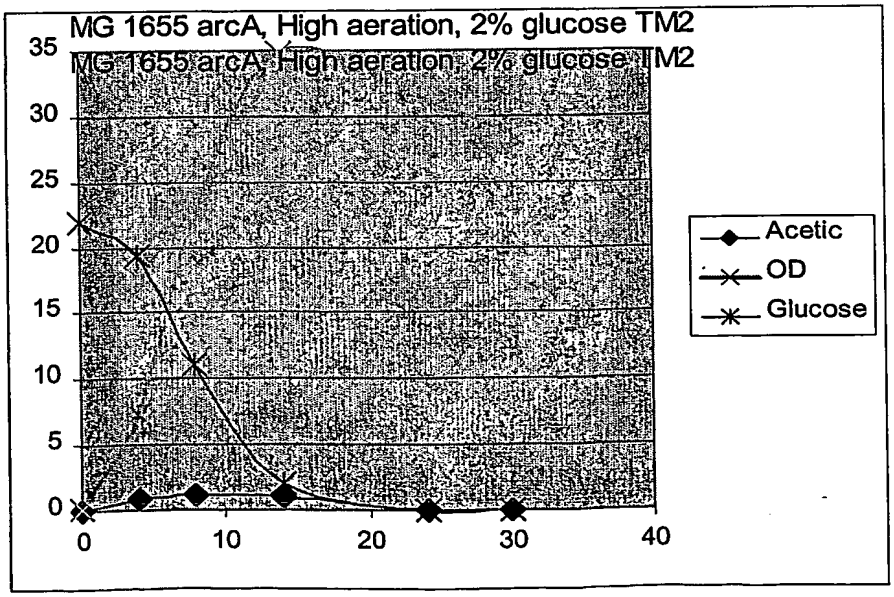


Figure 5

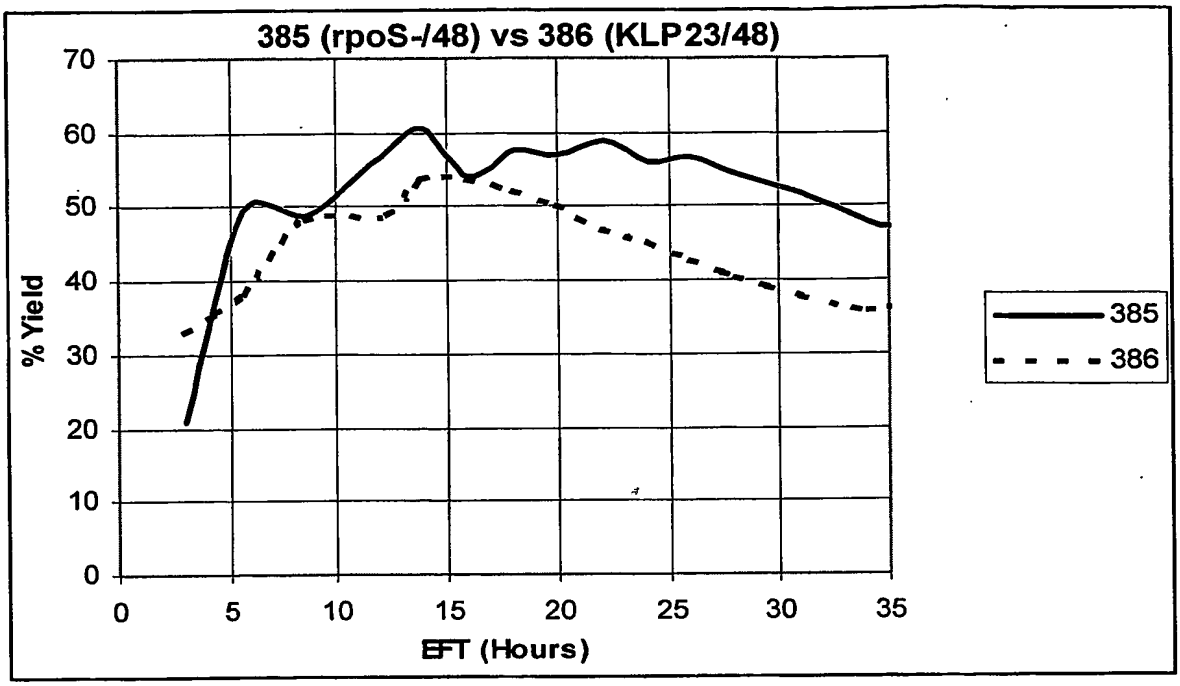

385 (rpoS-/48) vs 386 (KLP23/48)
% Yield
EFT (Hours)
0
10
20
30
40
50
60
70
0
5
10
15
20
25
30
35
385
386

FIG. 6A.

TAGTAAAGCCCTCGCTAGATTTTAATGCGGATGTTGCGATTACTTCGCCAACTAT
TGCGATAACAAGAAAAAGCCAGCCTTTCATGATATATCTCCCAATTTGTGTAGGG
CTTATTATGCACGCTTAAAAATAATAAAAGCAGACTTGACCTGATAGTTTGGCTG
TGAGCAATTATGTGCTTAGTGCATCTAACGCTTGAGTTAAGCCGCGCCGCGAAG
CGGCGTCGGCTTGAACGAATTGTTAGACATTATTTGCCGACTACCTTGGTGATC
TCGCCTTTCACGTAGTGGACAAATTCTTCCAACTGATCTGCGCGCGAGGCCAAG
CGATCTTCTTCTTGTCCAAGATAAGCCTGTCTAGCTTCAAGTATGACGGGCTGAT
ACTGGGCCGGCAGGCGCTCCATTGCCCAGTCGGCAGCGACATCCTTCGGCGC
GATTTTGCCGGTTACTGCGCTGTACCAAATGCGGGACAACGTAAGCACTACATT
TCGCTCATCGCCAGCCCAGTCGGGCGGCGAGTTCCATAGCGTTAAGGTTTCAT
TTAGCGCCTCAAATAGATCCTGTTCAGGAACCGGATCAAAGAGTTCCTCCGCCG
CTGGACCTACCAAGGCAACGCTATGTTCTCTTGCTTTTGTCAGCAAGATAGCCA
GATCAATGTCGATCGTGGCTGGCTCGAAGATACCTGCAAGAATGTCATTGCGCT
GCCATTCTCCAAATTGCAGTTCGCGCTTAGCTGGATAACGCCACGGAATGATGT
CGTCGTGCACAACAATGGTGACTTCTACAGCGCGGAGAATCTCGCTCTCTCCAG
GGGAAGCCGAAGTTTCCAAAAGGTCGTTGATCAAAGCTCGCCGCGTTGTTTCAT
CAAGCCTTACGGTCACCGTAACCAGCAAATCAATATCACTGTGTGGCTTCAGGC
CGCCATCCACTGCGGAGCCGTACAAATGTACGGCCAGCAACGTCGGTTCGAGA
TGGCGCTCGATGACGCCAACTACCTCTGATAGTTGAGTCGATACTTCGGCGATC
ACCGCTTCCCTCATGATGTTTAACTTTGTTTTAGGGCGACTGCCCTGCTGCGTA
ACATCGTTGCTGCTCCATAACATCAAACATCGACCCACGGCGTAACGCGCTTGC
TGCTTGGATGCCCGAGGCATAGACTGTACCCCAAAAAAACAGTCATAACAAGCC
ATGAAAACCGCCACTGCGCCGTTACCACCGCTGCGTTCGGTCAAGGTTCTGGA
CCAGTTGCGTGAGCGCATACGCTACTTGCATTACAGCTTACGAACCGAACAGGC
TTATGTCCACTGGGTTCGTGCCTTCATCCGTTTCCACGGTGTGCGTCACCCGGC
AACCTTGGGCAGCAGCGAAGTCGAGGCATTTCTGTCCTGGCTGGCGAACGAGC
GCAAGGTTTCGGTCTCCACGCATCGTCAGGCATTGGCGGCCTTGCTGTTCTTCT
ACGGCAAGGTGCTGTGCACGGATCTGCCCTGGCTTCAGGAGATCGGAAGACCT
CGGCCGTCGCGGCGCTTGCCGGTGGTGCTGACCCCGGATGAAGTGGTTCGCA
TCCTCGGTTTTCTGGAAGGCGAGCATCGTTTGTTCGCCCAGCTTCTGTATGGAA
CGGGCATGCGGATCAGTGAGGGTTTGCAACTGCGGGTCAAGGATCTGGATTTC
GATCACGGCACGATCATCGTGCGGGAGGGCAAGGGCTCCAAGGATCGGGCCT
TGATGTTACCCGAGAGCTTGGCACCCAGCCTGCGCGAGCAGGGGAATTAATTC

FIG. 6B

CCACGGGTTTTGCTGCCCGCAAACGGGCTGTTCTGGTGTTGCTAGTTTGTTATC
AGAATCGCAGATCCGGCTTCAGCCGGTTTGCCGGCTGAAAGCGCTATTTCTTCC
AGAATTGCCATGATTTTTTCCCCACGGGAGGCGTCACTGGCTCCCGTGTTGTCG
GCAGCTTTGATTCGATAAGCAGCATCGCCTGTTTCAGGCTGTCTATGTGTGACT
GTTGAGCTGTAACAAGTTGTCTCAGGTGTTCAATTTCATGTTCTAGTTGCTTTGT
TTTACTGGTTTCACCTGTTCTATTAGGTGTTACATGCTGTTCATCTGTTACATTGT
CGATCTGTTCATGGTGAACAGCTTTGAATGCACCAAAAACTCGTAAAAGCTCTG
ATGTATCTATCTTTTTTACACCGTTTTCATCTGTGCATATGGACAGTTTTCCCTTT
GATATGTAACGGTGAACAGTTGTTCTACTTTTGTTTGTTAGTCTTGATGCTTCACT
GATAGATACAAGAGCCATAAGAACCTCAGATCCTTCCGTATTTAGCCAGTATGTT
CTCTAGTGTGGTTCGTTGTTTTTGCGTGAGCCATGAGAACGAACCATTGAGATC
ATACTTACTTTGCATGTCACTCAAAAATTTTGCCTCAAAACTGGTGAGCTGAATTT
TTGCAGTTAAAGCATCGTGTAGTGTTTTTCTTAGTCCGTTATGTAGGTAGGAATC
TGATGTAATGGTTGTTGGTATTTTGTCACCATTCATTTTTATCTGGTTGTTCTCAA
GTTCGGTTACGAGATCCATTTGTCTATCTAGTTCAACTTGGAAAATCAACGTATC
AGTCGGGCGGCCTCGCTTATCAACCACCAATTTCATATTGCTGTAAGTGTTTAAA
TCTTTACTTATTGGTTTCAAAACCCATTGGTTAAGCCTTTTAAACTCATGGTAGTT
ATTTTCAAGCATTAACATGAACTTAAATTCATCAAGGCTAATCTCTATATTTGCCT
TGTGAGTTTTCTTTTGTGTTAGTTCTTTTAATAACCACTCATAAATCCTCATAGAG
TATTTGTTTTCAAAAGACTTAACATGTTCCAGATTATATTTTATGAATTTTTTTAAC
TGGAAAAGATAAGGCAATATCTCTTCACTAAAAACTAATTCTAATTTTTCGCTTGA
GAACTTGGCATAGTTTGTCCACTGGAAAATCTCAAAGCCTTTAACCAAAGGATTC
CTGATTTCCACAGTTCTCGTCATCAGCTCTCTGGTTGCTTTAGCTAATACACCAT
AAGCATTTTCCCTACTGATGTTCATCATCTGAGCGTATTGGTTATAAGTGAACGA
TACCGTCCGTTCTTTCCTTGTAGGGTTTTCAATCGTGGGGTTGAGTAGTGCCAC
ACAGCATAAAATTAGCTTGGTTTCATGCTCCGTTAAGTCATAGCGACTAATCGCT
AGTTCATTTGCTTTGAAAACAACTAATTCAGACATACATCTCAATTGGTCTAGGT
GATTTTAATCACTATACCAATTGAGATGGGCTAGTCAATGATAATTACTAGTCCTT
TTCCTTTGAGTTGTGGGTATCTGTAAATTCTGCTAGACCTTTGCTGGAAAACTTG
TAAATTCTGCTAGACCCTCTGTAAATTCCGCTAGACCTTTGTGTGTTTTTTTTGTT
TATATTCAAGTGGTTATAATTTATAGAATAAAGAAAGAATAAAAAAAGATAAAAAG
AATAGATCCCAGCCCTGTGTATAACTCACTACTTTAGTCAGTTCCGCAGTATTAC
AAAAGGATGTCGCAAACGCTGTTTGCTCCTCTACAAAACAGACCTTAAAACCCTA

FIG. 6C

AAGGCTTAAGTAGCACCCTCGCAAGCTCGGGCAAATCGCTGAATATTCCTTTTG
TCTCCGACCATCAGGCACCTGAGTCGCTGTCTTTTTCGTGACATTCAGTTCGCT
GCGCTCACGGCTCTGGCAGTGAATGGGGGTAAATGGCACTACAGGCGCCTTTT
ATGGATTCATGCAAGGAAACTACCCATAATACAAGAAAAGCCCGTCACGGGCTT
CTCAGGGCGTTTTATGGCGGGTCTGCTATGTGGTGCTATCTGACTTTTTGCTGT
TCAGCAGTTCCTGCCCTCTGATTTTCCAGTCTGACCACTTCGGATTATCCCGTG
ACAGGTCATTCAGACTGGCTAATGCACCCAGTAAGGCAGCGGTATCATCAACAG
GCTTACCCGTCTTACTGTCGGGAATTCATTTAAATAGTCAAAAGCCTCCGACCG
GAGGCTTTTGACTGCTAGGCGATCTGTGCTGTTTGCCACGGTATGCAGCACCA
GCGCGAGATTATGGGCTCGCACGCTCGACTGTCGGACGGGGGCACTGGAACG
AGAAGTCAGGCGAGCCGTCACGCCCTTGACAATGCCACATCCTGAGCAAATAAT
TCAACCACTAAACAAATCAACCGCGTTTCCCGGAGGTAACCAAGCTTGCGGGAG
AGAATGATGAACAAGAGCCAACAAGTTCAGACAATCACCCTGGCCGCCGCCCA
GCAAATGGCGGCGGCGGTGGAAAAAAAAGCCACTGAGATCAACGTGGCGGTG
GTGTTTTCCGTAGTTGACCGCGGAGGCAACACGCTGCTTATCCAGCGGATGGA
CGAGGCCTTCGTCTCCAGCTGCGATATTTCCCTGAATAAAGCCTGGAGCGCCT
GCAGCCTGAAGCAAGGTACCCATGAAATTACGTCAGCGGTCCAGCCAGGACAA
TCTCTGTACGGTCTGCAGCTAACCAACCAACAGCGAATTATTATTTTTGGCGGC
GGCCTGCCAGTTATTTTTAATGAGCAGGTAATTGGCGCCGTCGGCGTTAGCGG
CGGTACGGTCGAGCAGGATCAATTATTAGCCCAGTGCGCCCTGGATTGTTTTTC
CGCATTATAACCTGAAGCGAGAAGGTATATTATGAGCTATCGTATGTTCCGCCA
GGCATTCTGAGTGTTAACGAGGGGACCGTCATGTCGCTTTCACCGCCAGGCGT
ACGCCTGTTTTACGATCCGCGCGGGCACCATGCCGGCGCCATCAATGAGCTGT
GCTGGGGGCTGGAGGAGCAGGGGGTCCCCTGCCAGACCATAACCTATGACGG
AGGCGGTGACGCCGCTGCGCTGGGCGCCCTGGCGGCCAGAAGCTCGCCCCT
GCGGGTGGGTATCGGGCTCAGCGCGTCCGGCGAGATAGCCCTCACTCATGCC
CAGCTGCCGGCGGACGCGCCGCTGGCTACCGGACACGTCACCGATAGCGACG
ATCAACTGCGTACGCTCGGCGCCAACGCCGGGCAGCTGGTTAAAGTCCTGCCG
TTAAGTGAGAGAAACTGAATGTATCGTATCTATACCCGCACCGGGGATAAAGGC
ACCACCGCCCTGTACGGCGGCAGCCGCATCGAGAAAGACCATATTCGCGTCGA
GGCCTACGGCACCGTCGATGAACTGATATCCCAGCTGGGCGTCTGCTACGCCA
CGACCCGCGACGCCGGGCTGCGGGAAAGCCTGCACCATATTCAGCAGACGCT
GTTCGTGCTGGGGGCTGAACTGGCCAGCGATGCGCGGGGCCTGACCCGCCTG

FIG. 6D

AGCCAGACGATCGGCGAAGAGGAGATCACCGCCCTGGAGCGGCTTATCGACC
GCAATATGGCCGAGAGCGGCCCGTTAAAACAGTTCGTGATCCCGGGGAGGAAT
CTCGCCTCTGCCCAGCTGCACGTGGCGCGCACCCAGTCCCGTCGGCTCGAAC
GCCTGCTGACGGCCATGGACCGCGCGCATCCGCTGCGCGACGCGCTCAAACG
CTACAGCAATCGCCTGTCGGATGCCCTGTTCTCCATGGCGCGAATCGAAGAGA
CTAGGCCTGATGCTTGCGCTTGAACTGGCCTAGCAAACACAGAAAAAAGCCCG
CACCTGACAGTGCGGGCTTTTTTTTTCCTAGGCGATCTGTGCTGTTTGCCACGG
TATGCAGCACCAGCGCGAGATTATGGGCTCGCACGCTCGACTGTCGGACGGG
GGCACTGGAACGAGAAGTCAGGCGAGCCGTCACGCCCTTGACAATGCCACATC
CTGAGCAAATAATTCAACCACTAAACAAATCAACCGCGTTTCCCGGAGGTAACC
AAGCTTCACCTTTTGAGCCGATGAACAATGAAAAGATCAAAACGATTTGCAGTAC
TGGCCCAGCGCCCCGTCAATCAGGACGGGCTGATTGGCGAGTGGCCTGAAGA
GGGGCTGATCGCCATGGACAGCCCCTTTGACCCGGTCTCTTCAGTAAAAGTGG
ACAACGGTCTGATCGTCGAACTGGACGGCAAACGCCGGGACCAGTTTGACATG
ATCGACCGATTTATCGCCGATTACGCGATCAACGTTGAGCGCACAGAGCAGGC
AATGCGCCTGGAGGCGGTGGAAATAGCCCGTATGCTGGTGGATATTCACGTCA
GCCGGGAGGAGATCATTGCCATCACTACCGCCATCACGCCGGCCAAAGCGGTC
GAGGTGATGGCGCAGATGAACGTGGTGGAGATGATGATGGCGCTGCAGAAGAT
GCGTGCCCGCCGGACCCCCTCCAACCAGTGCCACGTCACCAATCTCAAAGATA
ATCCGGTGCAGATTGCCGCTGACGCCGCCGAGGCCGGGATCCGCGGCTTCTC
AGAACAGGAGACCACGGTCGGTATCGCGCGCTACGCGCCGTTTAACGCCCTGG
CGCTGTTGGTCGGTTCGCAGTGCGGCCGCCCCGGCGTGTTGACGCAGTGCTC
GGTGGAAGAGGCCACCGAGCTGGAGCTGGGCATGCGTGGCTTAACCAGCTAC
GCCGAGACGGTGTCGGTCTACGGCACCGAAGCGGTATTTACCGACGGCGATGA
TACGCCGTGGTCAAAGGCGTTCCTCGCCTCGGCCTACGCCTCCCGCGGGTTGA
AAATGCGCTACACCTCCGGCACCGGATCCGAAGCGCTGATGGGCTATTCGGAG
AGCAAGTCGATGCTCTACCTCGAATCGCGCTGCATCTTCATTACTAAAGGCGCC
GGGGTTCAGGGACTGCAAAACGGCGCGGTGAGCTGTATCGGCATGACCGGCG
CTGTGCCGTCGGGCATTCGGGCGGTGCTGGCGGAAAACCTGATCGCCTCTATG
CTCGACCTCGAAGTGGCGTCCGCCAACGACCAGACTTTCTCCCACTCGGATATT
CGCCGCACCGCGCGCACCCTGATGCAGATGCTGCCGGGCACCGACTTTATTTT
CTCCGGCTACAGCGCGGTGCCGAACTACGACAACATGTTCGCCGGCTCGAACT
TCGATGCGGAAGATTTTGATGATTACAACATCCTGCAGCGTGACCTGATGGTTG

FIG. 6E

ACGGCGGCCTGCGTCCGGTGACCGAGGCGGAAACCATTGCCATTCGCCAGAA
AGCGGCGCGGGCGATCCAGGCGGTTTTCCGCGAGCTGGGGCTGCCGCCAATC
GCCGACGAGGAGGTGGAGGCCGCCACCTACGCGCACGGCAGCAACGAGATGC
CGCCGCGTAACGTGGTGGAGGATCTGAGTGCGGTGGAAGAGATGATGAAGCG
CAACATCACCGGCCTCGATATTGTCGGCGCGCTGAGCCGCAGCGGCTTTGAGG
ATATCGCCAGCAATATTCTCAATATGCTGCGCCAGCGGGTCACCGGCGATTACC
TGCAGACCTCGGCCATTCTCGATCGGCAGTTCGAGGTGGTGAGTGCGGTCAAC
GACATCAATGACTATCAGGGGCCGGGCACCGGCTATCGCATCTCTGCCGAACG
CTGGGCGGAGATCAAAAATATTCCGGGCGTGGTTCAGCCCGACACCATTGAAT
AAGGCGGTATTCCTGTGCAACAGACAACCCAAATTCAGCCCTCTTTTACCCTGA
AAACCCGCGAGGGCGGGGTAGCTTCTGCCGATGAACGCGCCGATGAAGTGGT
GATCGGCGTCGGCCCTGCCTTCGATAAACACCAGCATCACACTCTGATCGATAT
GCCCCATGGCGCGATCCTCAAAGAGCTGATTGCCGGGGTGGAAGAAGAGGGG
CTTCACGCCCGGGTGGTGCGCATTCTGCGCACGTCCGACGTCTCCTTTATGGC
CTGGGATGCGGCCAACCTGAGCGGCTCGGGGATCGGCATCGGTATCCAGTCG
AAGGGGACCACGGTCATCCATCAGCGCGATCTGCTGCCGCTCAGCAACCTGGA
GCTGTTCTCCCAGGCGCCGCTGCTGACGCTGGAGACCTACCGGCAGATTGGCA
AAAACGCTGCGCGCTATGCGCGCAAAGAGTCACCTTCGCCGGTGCCGGTGGTG
AACGATCAGATGGTGCGGCCGAAATTTATGGCCAAAGCCGCGCTATTTCATATC
AAAGAGACCAAACATGTGGTGCAGGACGCCGAGCCCGTCACCCTGCACATCGA
CTTAGTAAGGGAGTGACCATGAGCGAGAAAACCATGCGCGTGCAGGATTATCC
GTTAGCCACCCGCTGCCCGGAGCATATCCTGACGCCTACCGGCAAACCATTGA
CCGATATTACCCTCGAGAAGGTGCTCTCTGGCGAGGTGGGCCCGCAGGATGTG
CGGATCTCCCGCCAGACCCTTGAGTACCAGGCGCAGATTGCCGAGCAGATGCA
GCGCCATGCGGTGGCGCGCAATTTCCGCCGCGCGGCGGAGCTTATCGCCATT
CCTGACGAGCGCATTCTGGCTATCTATAACGCGCTGCGCCCGTTCCGCTCCTC
GCAGGCGGAGCTGCTGGCGATCGCCGACGAGCTGGAGCACACCTGGCATGCG
ACAGTGAATGCCGCCTTTGTCCGGGAGTCGGCGGAAGTGTATCAGCAGCGGCA
TAAGCTGCGTAAAGGAAGCTAAGCGGAGGTCAGCATGCCGTTAATAGCCGGGA
TTGATATCGGCAACGCCACCACCGAGGTGGCGCTGGCGTCCGACTACCCGCAG
GCGAGGGCGTTTGTTGCCAGCGGGATCGTCGCGACGACGGGCATGAAAGGGA
CGCGGGACAATATCGCCGGGACCCTCGCCGCGCTGGAGCAGGCCCTGGCGAA
AACACCGTGGTCGATGAGCGATGTCTCTCGCATCTATCTTAACGAAGCCGCGCC

FIG. 6F

GGTGATTGGCGATGTGGCGATGGAGACCATCACCGAGACCATTATCACCGAAT
CGACCATGATCGGTCATAACCCGCAGACGCCGGGCGGGGTGGGCGTTGGCGT
GGGGACGACTATCGCCCTCGGGCGGCTGGCGACGCTGCCGGCGGCGCAGTAT
GCCGAGGGGTGGATCGTACTGATTGACGACGCCGTCGATTTCCTTGACGCCGT
GTGGTGGCTCAATGAGGCGCTCGACCGGGGGATCAACGTGGTGGCGGCGATC
CTCAAAAAGGACGACGGCGTGCTGGTGAACAACCGCCTGCGTAAAACCCTGCC
GGTGGTGGATGAAGTGACGCTGCTGGAGCAGGTCCCCGAGGGGGTAATGGCG
GCGGTGGAAGTGGCCGCGCCGGGCCAGGTGGTGCGGATCCTGTCGAATCCCT
ACGGGATCGCCACCTTCTTCGGGCTAAGCCCGGAAGAGACCCAGGCCATCGTC
CCCATCGCCCGCGCCCTGATTGGCAACCGTTCCGCGGTGGTGCTCAAGACCCC
GCAGGGGGATGTGCAGTCGCGGGTGATCCCGGCGGGCAACCTCTACATTAGC
GGCGAAAAGCGCCGCGGAGAGGCCGATGTCGCCGAGGGCGCGGAAGCCATC
ATGCAGGCGATGAGCGCCTGCGCTCCGGTACGCGACATCCGCGGCGAACCGG
GCACCCACGCCGGCGGCATGCTTGAGCGGGTGCGCAAGGTAATGGCGTCCCT
GACCGGCCATGAGATGAGCGCGATATACATCCAGGATCTGCTGGCGGTGGATA
CGTTTATTCCGCGCAAGGTGCAGGGCGGGATGGCCGGCGAGTGCGCCATGGA
GAATGCCGTCGGGATGGCGGCGATGGTGAAAGCGGATCGTCTGCAAATGCAG
GTTATCGCCCGCGAACTGAGCGCCCGACTGCAGACCGAGGTGGTGGTGGGCG
GCGTGGAGGCCAACATGGCCATCGCCGGGGCGTTAACCACTCCCGGCTGTGC
GGCGCCGCTGGCGATCCTCGACCTCGGCGCCGGCTCGACGGATGCGGCGATC
GTCAACGCGGAGGGGCAGATAACGGCGGTCCATCTCGCCGGGGCGGGGAATA
TGGTCAGCCTGTTGATTAAAACCGAGCTGGGCCTCGAGGATCTTTCGCTGGCG
GAAGCGATAAAAAAATACCCGCTGGCCAAAGTGGAAAGCCTGTTCAGTATTCGT
CACGAGAATGGCGCGGTGGAGTTCTTTCGGGAAGCCCTCAGCCCGGCGGTGTT
CGCCAAAGTGGTGTACATCAAGGAGGGCGAACTGGTGCCGATCGATAACGCCA
GCCCGCTGGAAAAAATTCGTCTCGTGCGCCGGCAGGCGAAAGAGAAAGTGTTT
GTCACCAACTGCCTGCGCGCGCTGCGCCAGGTCTCACCCGGCGGTTCCATTCG
CGATATCGCCTTTGTGGTGCTGGTGGGCGGCTCATCGCTGGACTTTGAGATCC
CGCAGCTTATCACGGAAGCCTTGTCGCACTATGGCGTGGTCGCCGGGCAGGG
CAATATTCGGGGAACAGAAGGGCCGCGCAATGCGGTCGCCACCGGGCTGCTA
CTGGCCGGTCAGGCGAATTAAACGGGCGCTCGCGCCAGCCTCTAGGTACAAAT
AAAAAAGGCACGTCAGATGACGTGCCTTTTTTCTTGTCTAGAGTACTGGCGAAA
GGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCCAGTC

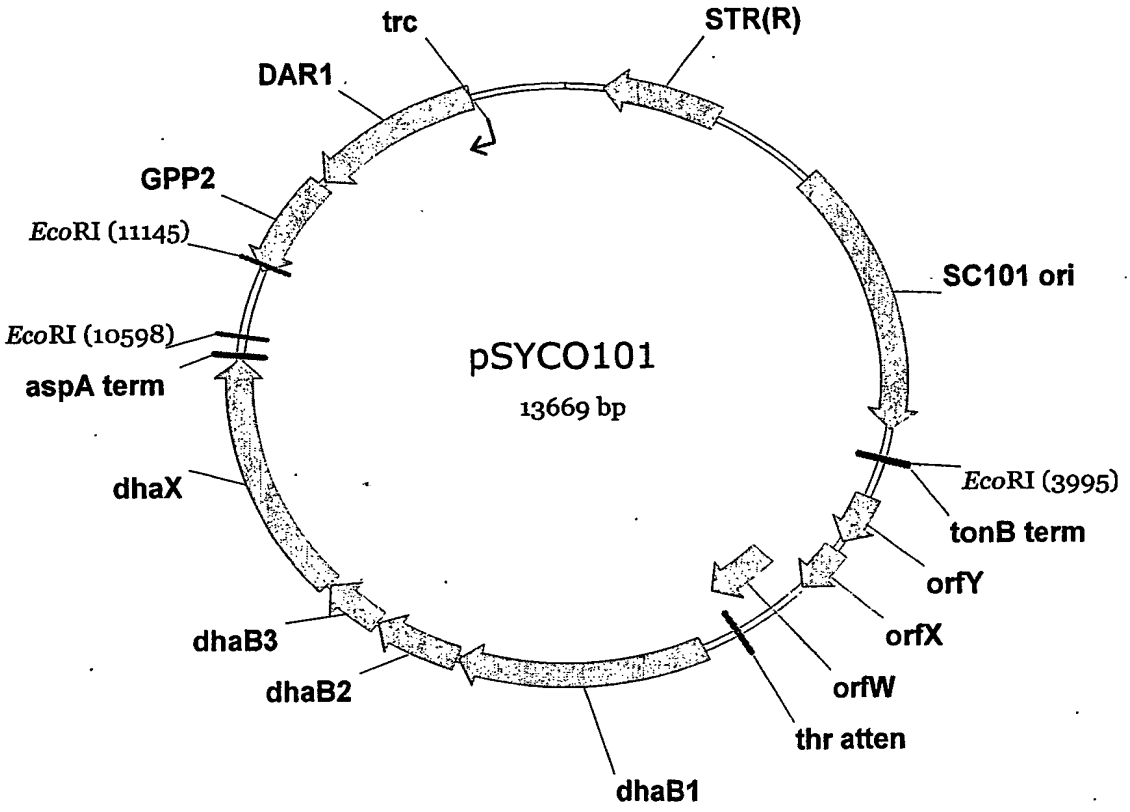
FIG. 6G

ACGACGTTGTAAAACGACGGCCAGTGAATTCGAGCTCGGTACCCGGGGCGGCC
GCGCTAGCGCCCGATCCAGCTGGAGTTTGTAGAAACGCAAAAAGGCCATCCGT
CAGGATGGCCTTCTGCTTAATTTGATGCCTGGCAGTTTATGGCGGGCGTCCTGC
CCGCCACCCTCCGGGCCGTTGCTTCGCAACGTTCAAATCCGCTCCCGGCGGAT
TTGTCCTACTCAGGAGAGCGTTCACCGACAAACAACAGATAAAACGAAAGGCCC
AGTCTTTCGACTGAGCCTTTCGTTTTATTTGATGCCTGGCAGTTCCCTACTCTCG
CATGGGGAGACCCCACACTACCATCGGCGCTACGGCGTTTCACTTCTGAGTTC
GGCATGGGGTCAGGTGGGACCACCGCGCTACTGCCGCCAGGCAAATTCTGTTT
TATCAGACCGCTTCTGCGTTCTGATTTAATCTGTATCAGGCTGAAAATCTTCTCT
CATCCGCCAAAACAGCCAAGCTTGCATGCCTGCAGCCCGGGTTACCATTTCAAC
AGATCGTCCTTAGCATATAAGTAGTCGTCAAAAATGAATTCAACTTCGTCTGTTT
CGGCATTGTAGCCGCCAACTCTGATGGATTCGTGGTTTTTGACAATGATGTCAC
AGCCTTTTTCCTTTAGGAAGTCCAAGTCGAAAGTAGTGGCAATACCAATGATCTT
ACAACCGGCGGCTTTTCCGGCGGCAATACCTGCTGGAGCGTCTTCAAATACTAC
TACCTTAGATTTGGAAGGGTCTTGCTCATTGATCGGATATCCTAAGCCATTCCTG
CCCTTCAGATATGGTTCTGGATGAGGCTTACCCTGTTTGACATCATTAGCGGTA
ATGAAGTACTTTGGTCTCCTGATTCCCAGATGCTCGAACCATTTTTGTGCCATAT
CACGGGTACCGGAAGTTGCCACAGCCCATTTCTCTTTTGGTAGAGCGTTCAAAG
CGTTGCACAGCTTAACTGCACCTGGGACTTCAATGGATTTTTCACCGTACTTGA
CCGGAATTTCAGCTTCTAATTTGTTAACATACTCTTCATTGGCAAAGTCTGGAGC
GAACTTAGCAATGGCATCAAACGTTCTCCAACCATGCGAGACTTGGATAACGTG
TTCAGCATCGAAATAAGGTTTGTCCTTACCGAAATCCCTCCAGAATGCAGCAAT
GGCTGGTTGAGAGATGATAATGGTACCGTCGACGTCGAACAAAGCGGCGTTAA
CTTTCAAAGATAGAGGTTTAGTAGTCAATCCCATAATTCTAGTCTGTTTCCTGGA
TCCAATAAATCTAATCTTCATGTAGATCTAATTCTTCAATCATGTCCGGCAGGTTC
TTCATTGGGTAGTTGTTGTAAACGATTTGGTATACGGCTTCAAATAATGGGAAGT
CTTCGACAGAGCCACATGTTTCCAACCATTCGTGAACTTCTTTGCAGGTAATTAA
ACCTTGAGCGGATTGGCCATTCAACAACTCCTTTTCACATTCCCAGGCGTCCTT
ACCAGAAGTAGCCATTAGCCTAGCAACCTTGACGTTTCTACCACCAGCGCAGGT
GGTGATCAAATCAGCAACACCAGCAGACTCTTGGTAGTATGTTTCTTCTCTAGAT
TCTGGGAAAAACATTTGACCGAATCTGATGATCTCACCCAAACCGACTCTTTGG
ATGGCAGCAGAAGCGTTGTTACCCCAGCCTAGACCTTCGACGAAACCACAACCT
AAGGCAACAACGTTCTTCAAAGCACCACAGATGGAGATACCAGCAACATCTTCG

FIG. 6H

ATGACACTAACGTGGAAGTAAGGTCTGTGGAACAAGGCCTTTAGAACCTTATGG
TCGACGTCCTTGCCCTCGCCTCTGAAATCCTTTGGAATGTGGTAAGCAACTGTT
GTTTCAGACCAGTGTTCTTGAGCGACTTCGGTGGCAATGTTAGCACCAGATAGA
GCACCACATTGAATACCTAGTTCCTCAGTGATGTAAGAGGATAGCAATTGGACA
CCTTTAGCACCAACTTCAAAACCCTTTAGACAGGAGATAGCTCTGACGTGTGAA
TCAACATGACCTTTCAATTGGCTACAGATACGGGGCAAAAATTGATGTGGAATG
TTGAAAACGATGATGTCGACATCCTTGACTGAATCAATCAAGTCTGGATTAGCAA
CCAAATTGTCGGGTAGAGTGATGCCAGGCAAGTATTTCACGTTTTGATGTCTAG
TATTTATGATTTCAGTCAATTTTTCACCATTGATCTCTTCTTCGAACACCCACATT
TGTACTATTGGAGCGAAAACTTCTGGGTATCCCTTACAATTTTCGGCAACCACCT
TGGCAATAGTAGTACCCCAGTTACCAGATCCAATCACAGTAACCTTGAAAGGCT
TTTCGGCAGCCTTCAAAGAAACAGAAGAGGAACTTCTCTTTCTACCAGCATTCAA
GTGGCCGGAAGTTAAGTTTAATCTATCAGCAGCAGCAGCCATGGAATTGTCCTC
CTTACTAGTCATGGTCTGTTTCCTGTGTGAAATTGTTATCCGCTCACAATTCCAC
ACATTATACGAGCCGGATGATTAATTGTCAACAGCTCATTTCAGAATATTTGCCA
GAACCGTTATGATGTCGGCGCAAAAAACATTATCCAGAACGGGAGTGCGCCTTG
AGCGACACGAATTATGCAGTGATTTACGACCTGCACAGCCATACCACAGCTTCC
GATGGCTGCCTGACGCCAGAAGCATTGGTGCACGCTAGCCAGTACATTTAAATG
GTACCCTCTAGTCAAGGCCTTAAGTGAGTCGTATTACGGACTGGCCGTCGTTTT
ACAACGTCGTGACTGGGAAAACCCTGGCGTTACCCAACTTAATCGCCTTGCAGC
ACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGCC
CTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGGCGCCTGATGCGGTATTTTC
TCCTTACGCATCTGTGCGGTATTTCACACCGCATATGGTGCACTCTCAGTACAAT
CTGCTCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTG
ACGAGCT

FIG. 7


trc
STR(R)
DAR1
GPP2
EcoRI (11145)
SC101 ori
EcoRI (10598)
pSYCO101
13669 bp
aspA term
EcoRI (3995)
tonB term
dhaX
orfY
orfX
dhaB3
orfW
dhaB2
thr atten
dhaB1